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Exact wormhole solutions with nonminimal kinetic coupling

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Copyright © 2018 by the Editors.All rights reserved. We consider static spherically symmetric solutions in the scalar-tensor theory of gravity with a scalar field possessing the nonminimal kinetic coupling to the curvature. The lagrangian of the theory contains the term $(\varepsilon g_{\mu\nu} + \eta G_{\mu\nu})\phi_{,\mu}\phi_{,\nu}$ and represents a particular case of the general Horndeski lagrangian, which leads to second-order equations of motion. We use the Rinaldi approach to construct analytical solutions describing wormholes with nonminimal kinetic coupling. It is shown that wormholes exist only if $\varepsilon = -1$ (phantom case) and $\eta > 0$. The wormhole throat connects two anti-de Sitter spacetimes. The wormhole metric has a coordinate singularity at the throat. However, since all curvature invariants are regular, there is no curvature singularity there.

Keywords

MG14 Proceedings, Nonminimal kinetic coupling, Wormholes

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